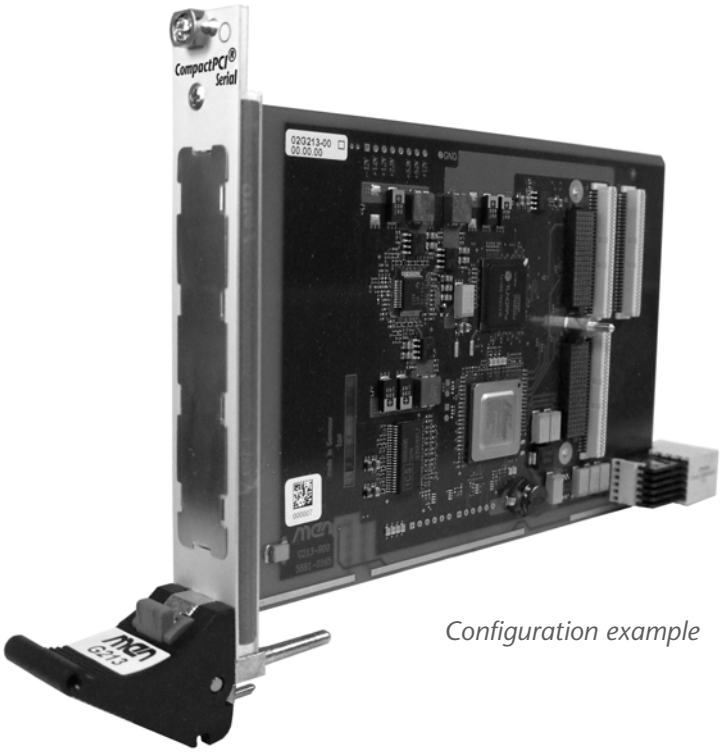
Embedded Solutions

# G213 – 3U CompactPCI® Serial XMC Carrier




*Configuration example*

*User Manual*

mikro elektronik
gmbh · nürnberg

# G213 - 3U CompactPCI Serial XMC Carrier

The G213 is a universal 3U XMC or PMC carrier board for I/O with high speed requirements in a CompactPCI® Serial environment. It allows to add I/O functions to a CompactPCI® Serial or hybrid system in a flexible way.

The G213 offers instant access to the already existing high-speed XMC modules on the market as well as to the huge range of legacy PMC modules of all different speed types. It supports efficient modular system extension with I/O that reaches from typical computer functions like communication or graphics up to the whole world of industrial functions with analog and binary I/O, measurement, instrumentation, motion control, or fieldbus interfaces.

The G213 is screened for -40 to +85°C operation temperature and prepared for conformal coating in order to be used also in harsh and mobile environments. The final environmental qualification depends on the respective cards used on the carrier.

# Technical Data

### XMC Slot

- Compliant with XMC standard VITA 42.3-2006
- Two PCI Express® links with four lanes each on J15 and J16

### PMC Slot

- Via PCI Express® to PCI-X Bridge
  - Support of PCI-X or PCI local bus specification 2.2
  - Support of one PCI Express® link with up to four lanes
- 32/64-bit, 33/66 MHz
- PCI-X, 133 MHz

### CompactPCI® Serial

- Compliance with CompactPCI® Serial PICMG CPCI-S.0 Specification (proposed standard currently under development)
- Peripheral slot

### Electrical Specifications

- Supply voltage/power consumption:
  - +12V (-10%/+10%), < 400 mA

### Mechanical Specifications

- Dimensions: standard single Eurocard
- Front panel: 4HP with ejector
- Weight: 120g (without mezzanine card)

### Environmental Specifications

- Temperature range (operation):
  - -40..+85°C (screened)
  - Airflow: min. 1.0 m/s
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz
- Conformal coating on request

### MTBF

- MTBF: tbd @ 40°C according to IEC/TR 62380 (RDF 2000)

### Safety

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

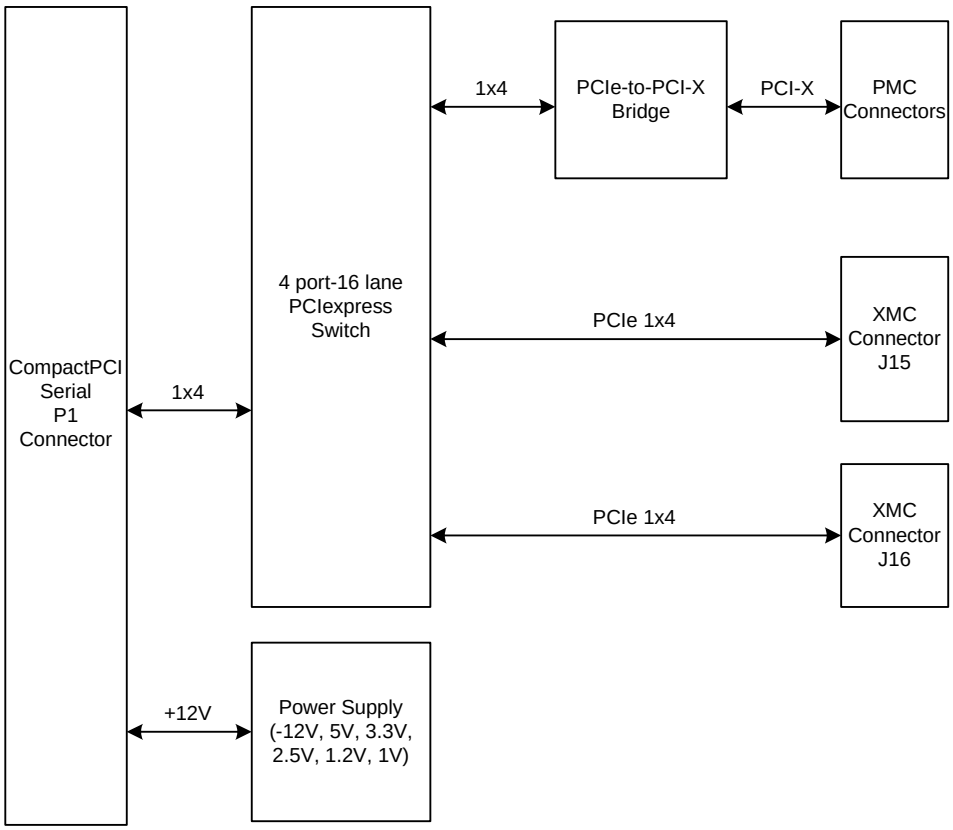
### EMC

- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst)

### Software Support

- XMC and PMC drivers as supported

# Block Diagram



# Product Safety

## Electrostatic Discharge (ESD)

Computer boards and components contain electrostatic sensitive devices. Electrostatic discharge (ESD) can damage components. To protect the board and other components against damage from static electricity, you should follow some precautions whenever you work on your computer.

- Power down and unplug your computer system when working on the inside.
- Hold components by the edges and try not to touch the IC chips, leads, or circuitry.
- Use a grounded wrist strap before handling computer components.
- Place components on a grounded antistatic pad or on the bag that came with the component whenever the components are separated from the system.
- Store the board only in its original ESD-protected packaging. Retain the original packaging in case you need to return the board to MEN for repair.

# About this Document

This user manual describes the hardware functions of the board, connection of peripheral devices and integration into a system. It also provides additional information for special applications and configurations of the board.

The manual does not include detailed information on individual components (data sheets etc.). A list of literature is given in the appendix.

## History

| Issue | Comments | Date |
|---|---|---|
| E1 | First issue | 2010-05-28 |

## Conventions

This sign marks important notes or warnings concerning proper functionality of the product described in this document. You should read them in any case.

*italics* — Folder, file and function names are printed in *italics*.

**bold** — **Bold** type is used for emphasis.

`monospace` — A `monospaced` font type is used for hexadecimal numbers, listings, C function descriptions or wherever appropriate. Hexadecimal numbers are preceded by "0x".

hyperlink — Hyperlinks are printed in blue color.

The globe will show you where hyperlinks lead directly to the Internet, so you can look for the latest information online.

IRQ# /IRQ — Signal names followed by "#" or preceded by a slash ("/") indicate that this signal is either active low or that it becomes active at a falling edge.

in/out — Signal directions in signal mnemonics tables generally refer to the corresponding board or component, "in" meaning "to the board or component", "out" meaning "coming from it".

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# 1 Getting Started

This chapter gives an overview of the board and some hints for first installation in a system.

## 1.1 Map of the Board

***Figure 1.*** *Map of the board – front panel*

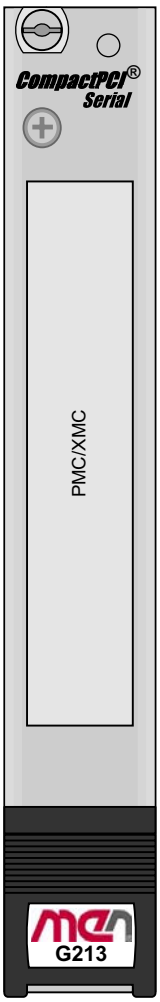
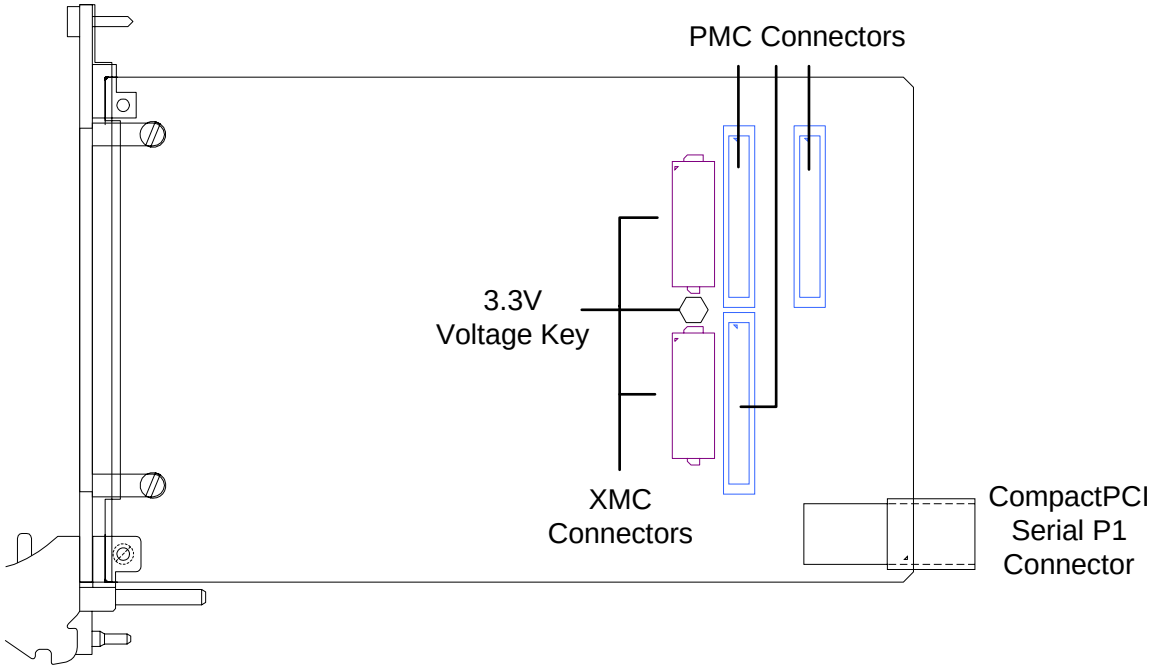


***Figure 2.*** *Map of the board – top view*



## 1.2 Integrating the Board into a System

You can use the following check list when installing the board in a system for the first time and with minimum configuration.

- ☑ Power-down the system.
- ☑ Install a PMC or XMC on the G213 as described in Chapter 1.3 Installing a PMC on page 14 or in Chapter 1.4 Installing an XMC on page 15.
- ☑ Insert the G213 into a peripheral slot of your CompactPCI Serial system, making sure that the CompactPCI Serial connectors are properly aligned.

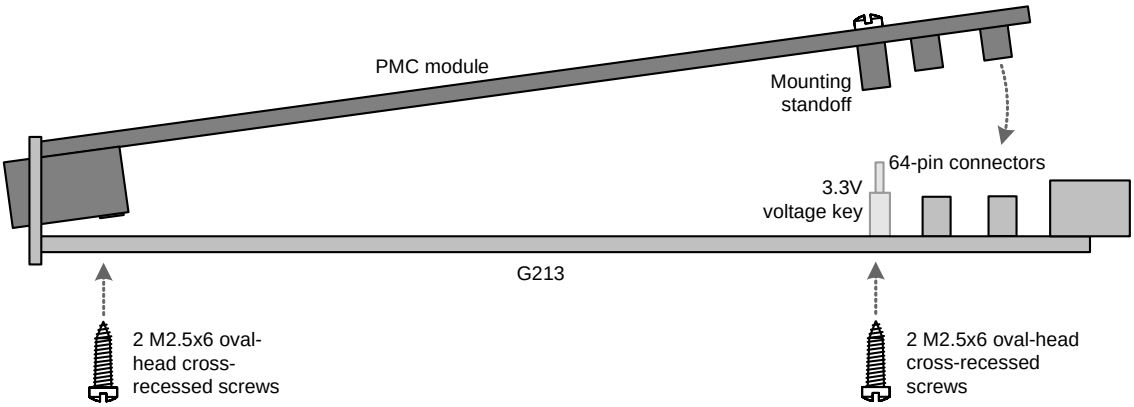
  Note: The peripheral slots of every CompactPCI Serial system are marked by a circle ○ on the backplane and/or at the front panel.
- ☑ Power-up the system.
- ☑ You can now install driver software for the G213.

## 1.3 Installing a PMC

Perform the following steps to install a PMC module:

- ☑ Make sure that the voltage keying of your PMC module matches the G213.
- ☑ Power down your system and remove the board from the system.
- ☑ Remove the filler panel from the board's front PMC slot, if installed.
- ☑ The PMC module is plugged on the board with the component sides of the PCBs facing each other.
- ☑ Put the PMC module's front connector through the front slot at a 45° angle.
- ☑ Carefully put it down, making sure that the connectors are properly aligned.
- ☑ Press the PMC module firmly onto the board.
- ☑ Make sure that the EMC gasket around the PMC front panel is properly in its place.
- ☑ Screw the PMC module tightly to the CPU board using the two mounting standoffs and four matching oval-head cross-recessed screws of type M2.5x6.

***Figure 3.*** *Installing a PMC mezzanine module*

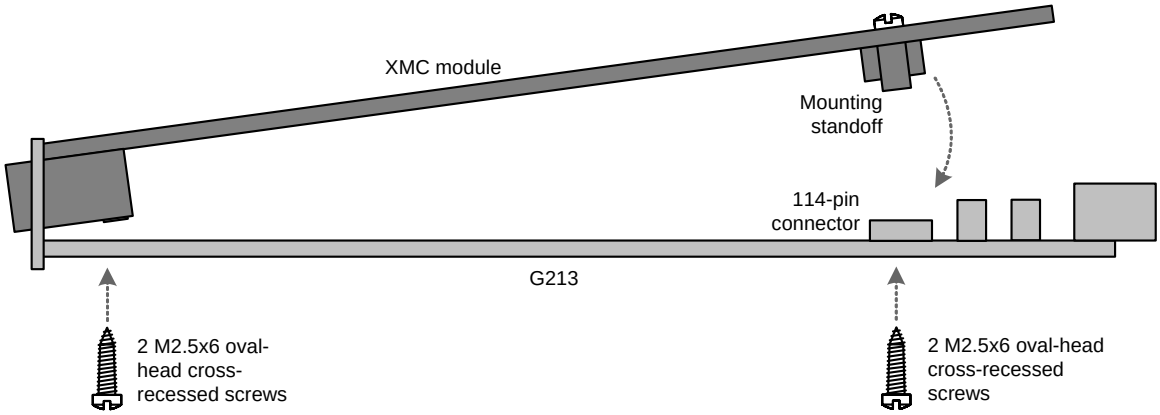



## 1.4 Installing an XMC

Perform the following steps to install an XMC module:

- ☑ Power down your system and remove the G213 from the system.
- ☑ Remove the filler panel from the board's front XMC slot, if installed.
- ☑ The XMC module is plugged on the G213 with the component sides of the PCBs facing each other.
- ☑ Put the XMC module's front connector through the G213's front slot at a 45° angle.
- ☑ Carefully put it down, making sure that the connectors are properly aligned.
- ☑ Press the XMC module firmly onto the G213.
- ☑ Make sure that the EMC gasket around the XMC front panel is properly in its place.
- ☑ Screw the XMC module tightly to the G213 using the two mounting standoffs and four matching oval-head cross-recessed screws of type M2.5x6.

***Figure 4.*** *Installing an XMC mezzanine module*



## 1.5 Installing Driver Software

For a detailed description on how to install driver software please refer to the respective documentation.

You can find any driver software available for download on MEN's website.

# 2 Functional Description

## 2.1 Power Supply

The G213 is supplied with a primary +12V voltage via the CompactPCI Serial connector P1.

## 2.2 PMC Interface

The G213 board provides one PMC slot for extension such as graphics, Fast Ethernet etc.

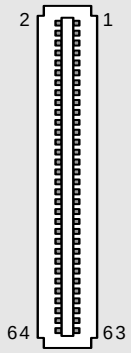
The signaling voltage is set to 3.3V, i. e. the carrier board has a 3.3V voltage key (see Figure 3, Installing a PMC mezzanine module, on page 15) and can only carry PMC mezzanines that support this keying configuration. Mezzanine cards may be designed to accept either or both signaling voltages (3.3V/5V).

The PMC-X slot supports 32/64 bit and 33/66/133 MHz.

Connector types:

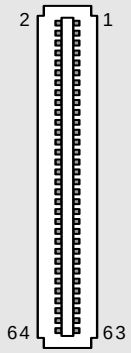
- 64-pin, 1-mm pitch board-to-board receptacle according to IEEE 1386
- Mating connector:
  64-pin, 1-mm pitch board-to-board plug according to IEEE 1386

***Table 1.*** *Pin assignment of 64-pin receptacle connector J11*



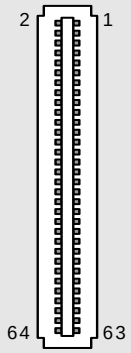

| | | | | |
|---|---|---|---|---|
| | 1 | - | 2 | -12V |
| | 3 | GND | 4 | INTA# |
| | 5 | INTB_R# | 6 | INTC_R# |
| | 7 | +3.3V | 8 | +5V |
| | 9 | INTD_R# | 10 | - |
| | 11 | GND | 12 | +3.3V aux |
| | 13 | CLK[0] | 14 | GND |
| | 15 | GND | 16 | GNT[0]# |
| | 17 | REQ[0]# | 18 | +5V |
| | 19 | V_IO | 20 | AD[31] |
| | 21 | AD[28] | 22 | AD[27] |
| | 23 | AD[25] | 24 | GND |
| | 25 | GND | 26 | C/BE[3]# |
| | 27 | AD[22] | 28 | AD[21] |
| | 29 | AD[19] | 30 | +5V |
| | 31 | +3.3V | 32 | AD[17] |
| | 33 | FRAME# | 34 | GND |
| | 35 | GND | 36 | IRDY# |
| | 37 | DEVSEL# | 38 | +5V |
| | 39 | PCIXCAP | 40 | LOCK# |
| | 41 | - | 42 | - |
| | 43 | PAR | 44 | GND |
| | 45 | +3.3V | 46 | AD[15] |
| | 47 | AD[12] | 48 | AD[11] |
| | 49 | AD[9] | 50 | +5V |
| | 51 | GND | 52 | C/BE[0]# |
| | 53 | AD[6] | 54 | AD[5] |
| | 55 | AD[4] | 56 | GND |
| | 57 | +3.3V | 58 | AD[3] |
| | 59 | AD[2] | 60 | AD[1] |
| | 61 | AD[0] | 62 | +5V |
| | 63 | GND | 64 | REQ64# |

***Table 2.*** *Pin assignment of 64-pin receptacle connector J12*




| | | | | |
|---|---|---|---|---|
| | 1 | +12V | 2 | - |
| | 3 | - | 4 | - |
| | 5 | - | 6 | GND |
| | 7 | GND | 8 | - |
| | 9 | - | 10 | - |
| | 11 | +3.3V | 12 | +3.3V |
| | 13 | RST# | 14 | GND |
| | 15 | +3.3V | 16 | GND |
| | 17 | PME# | 18 | GND |
| | 19 | AD[30] | 20 | AD[29] |
| | 21 | GND | 22 | AD[26] |
| | 23 | AD[24] | 24 | +3.3V |
| | 25 | IDSEL[0] | 26 | AD[23] |
| | 27 | +3.3V | 28 | AD[20] |
| | 29 | AD[18] | 30 | GND |
| | 31 | AD[16] | 32 | C/BE[2]# |
| | 33 | GND | 34 | - |
| | 35 | TRDY# | 36 | +3.3V |
| | 37 | GND | 38 | STOP# |
| | 39 | PERR# | 40 | GND |
| | 41 | +3.3V | 42 | SERR# |
| | 43 | C/BE[1]# | 44 | GND |
| | 45 | AD[14] | 46 | AD[13] |
| | 47 | M66EN_R | 48 | AD[10] |
| | 49 | AD[8] | 50 | +3.3V |
| | 51 | AD[7] | 52 | - |
| | 53 | +3.3V | 54 | - |
| | 55 | - | 56 | GND |
| | 57 | - | 58 | - |
| | 59 | GND | 60 | - |
| | 61 | ACK64# | 62 | +3.3V |
| | 63 | GND | 64 | - |

***Table 3.*** *Pin assignment of 64-pin plug connector J13*




| | | | | |
|---|---|---|---|---|
| | 1 | - | 2 | GND |
| | 3 | GND | 4 | C/BE[7]# |
| | 5 | C/BE[6]# | 6 | C/BE[5]# |
| | 7 | C/BE[4]# | 8 | GND |
| | 9 | +3.3V | 10 | PAR64 |
| | 11 | AD[63] | 12 | AD[62] |
| | 13 | AD[61] | 14 | GND |
| | 15 | GND | 16 | AD[60] |
| | 17 | AD[59] | 18 | AD[58] |
| | 19 | AD[57] | 20 | GND |
| | 21 | +3.3V | 22 | AD[56] |
| | 23 | AD[55] | 24 | AD[54] |
| | 25 | AD[53] | 26 | GND |
| | 27 | GND | 28 | AD[52] |
| | 29 | AD[51] | 30 | AD[50] |
| | 31 | AD[49] | 32 | GND |
| | 33 | GND | 34 | AD[48] |
| | 35 | AD[47] | 36 | AD[46] |
| | 37 | AD[45] | 38 | GND |
| | 39 | +3.3V | 40 | AD[44] |
| | 41 | AD[43] | 42 | AD[42] |
| | 43 | AD[41] | 44 | GND |
| | 45 | GND | 46 | AD[40] |
| | 47 | AD[39] | 48 | AD[38] |
| | 49 | AD[37] | 50 | GND |
| | 51 | GND | 52 | AD[36] |
| | 53 | AD[35] | 54 | AD[34] |
| | 55 | AD[33] | 56 | GND |
| | 57 | +3.3V | 58 | AD[32] |
| | 59 | - | 60 | - |
| | 61 | - | 62 | GND |
| | 63 | GND | 64 | - |

For a detailed description of the above signals refer to the PMC specification and the PCI-X Auxiliary Standard for PMCs and Processor PMCs. See Chapter 3.1 Literature and Web Resources on page 25.

## 2.3 XMC Slots

The G213 board provides one XMC slot for extension such as high-speed graphics, Ethernet etc.

XMC modules have the same form factor as PMC modules, however they do not use a PCI bus but a high-speed PCI Express connection and therefore have a different carrier board connector.

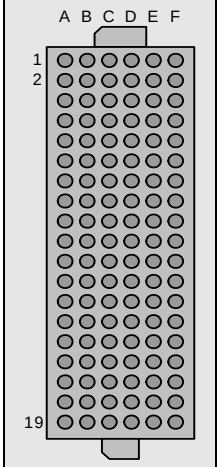
The G213 supports two PCI Express links consisting of four lanes for each link. Each link is led to one XMC connector as defined by the XMC Standard. The links are led to the XMC connectors via a PCI Express signal switch.

Connector types:

- 114-pin XMC receptacle connector
- Mating connector:
  114-pin XMC plug connector, e. g. SAMTEC ASP105885-01

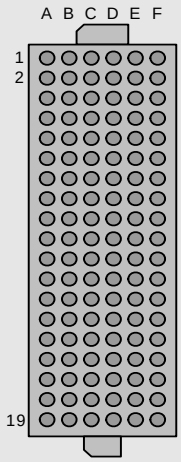
Note: The PCI Express receive and transmit signals are given according to the XMC standard, i.e. are seen from the point of view of the XMC module.

***Table 4.*** *Pin assignment of 114-pin XMC connector J15 with one x4 link (link 0)*




| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | PET0p0 | PET0n0 | +3.3V | PET0p1 | PET0n1 | +12V |
| 2 | GND | GND | - | GND | GND | MRSTI# |
| 3 | PET0p2 | PET0n2 | +3.3V | PET0p3 | PET0n3 | +12V |
| 4 | GND | GND | - | GND | GND | MRSTO# |
| 5 | - | - | +3.3V | - | - | +12V |
| 6 | GND | GND | - | GND | GND | +12V |
| 7 | - | - | +3.3V | - | - | +12V |
| 8 | GND | GND | - | GND | GND | -12V |
| 9 | - | - | - | - | - | +12V |
| 10 | GND | GND | - | GND | GND | GA0 |
| 11 | PER0p0 | PER0n0 | MBIST# | PER0p1 | PER0n1 | +12V |
| 12 | GND | GND | GA1 | GND | GND | MPRESENT# |
| 13 | PER0p2 | PER0n2 | +3.3V | PER0p3 | PER0n3 | +12V |
| 14 | GND | GND | GA2 | GND | GND | MSDA |
| 15 | - | - | - | - | - | +12V |
| 16 | GND | GND | MVMRO | GND | GND | MSCL |
| 17 | - | - | - | - | - | - |
| 18 | GND | GND | - | GND | GND | - |
| 19 | REFCLK+0 | REFCLK-0 | - | WAKE0# | ROOT0# | - |

***Table 5.*** *Pin assignment of 114-pin XMC connector J16 with the second x4 link (link 1)*




| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | PET1p0 | PET1n0 | - | PET1p1 | PET1n1 | - |
| 2 | GND | GND | - | GND | GND | - |
| 3 | PET1p2 | PET1n2 | - | PET1p3 | PET1n3 | - |
| 4 | GND | GND | - | GND | GND | - |
| 5 | - | - | - | - | - | - |
| 6 | GND | GND | - | GND | GND | - |
| 7 | - | - | - | - | - | - |
| 8 | GND | GND | - | GND | GND | - |
| 9 | - | - | - | - | - | - |
| 10 | GND | GND | - | GND | GND | - |
| 11 | PER1p0 | PER1n0 | - | PER1p1 | PER1n1 | - |
| 12 | GND | GND | - | GND | GND | - |
| 13 | PER1p2 | PER1n2 | - | PER1p3 | PER1n3 | - |
| 14 | GND | GND | - | GND | GND | - |
| 15 | - | - | - | - | - | - |
| 16 | GND | GND | - | GND | GND | - |
| 17 | - | - | - | - | - | - |
| 18 | GND | GND | - | GND | GND | - |
| 19 | REFCLK+1 | REFCLK-1 | - | - | - | - |

***Table 6.*** *Signal mnemonics of 114-pin XMC connector*

| | Signal | Direction | Function |
|---|---|---|---|
| **Power** | +12V, | out | +12V supply voltage |
| | -12V | out | -12V supply voltage |
| | +3.3V | out | +3.3V supply voltage |
| | GND | - | Ground |
| **PCI Express link 0** | PER0p/n[0..3] | out | PCI Express link 0 lane 0..3, differential receive of XMC module |
| | PET0p/n[0..3] | in | PCI Express link 0 lane 0..3, differential transmit of XMC module |
| | REFCLK+/-0 | out | Differential reference clock |
| | ROOT0# | out | Root Complex enabling |
| | WAKE# | out | Reactivation of power rails and reference clocks |
| **PCI Express link 1** | PER1p/n[0..3] | out | PCI Express link 1 lane 0..3, differential receive of XMC module |
| | PET1p/n[0..3] | in | PCI Express link 1 lane 0..3, differential transmit of XMC module |
| | REFCLK+/-1 | out | Differential reference clock |
| **Other** | GA[0..2] | out | I2C channel select |
| | MBIST# | in | XMC built-in self test |
| | MPRESENT# | in | Module present |
| | MRSTI# | out | XMC reset in |
| | MRSTO# | in | XMC reset out |
| | MSCL | out | IPMI I2C serial clock |
| | MSDA | in/out | IPMI I2C serial data |
| | MVMRO | out | XMC write prohibit |

## 2.4 CompactPCI Serial Interface

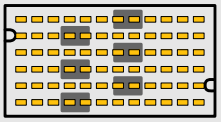
The G213 uses four PCI Express lanes at the backplane according to the CompactPCI Serial specification (PICMG CPCI-S.0, proposed standard under development).

Connector type of P1:

- 72-pin Airmax VS 4 pair, right angle header, 6 IMLA with end walls

See the following table for the pin assignment of the P1 connector:

***Table 7.*** *Pin assignment of CompactPCI Serial P1 connector*




| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PE_ Rx03- | PE_ Rx03+ | GND | PE_ Tx03- | PE_ Tx03+ | GND | PE_ Rx02- | PE_ Rx02+ | GND | PE_ Tx02- | PE_ Tx02+ | GND | 6 |
| GND | PE_ Rx01- | PE_ Rx01+ | GND | PE_ Tx01- | PE_ Tx01+ | GND | PE_ Rx00- | PE_ Rx00+ | GND | PE_ Tx00- | PE_ Tx00+ | 5 |
| - | - | GND | - | - | GND | PE_ REFCLK- | PE_ REFCLK+ | GND | - | - | GND | 4 |
| - | - | - | - | - | - | - | - | - | - | - | - | 3 |
| - | PCIE_ EN# | GND | PE_ WAKE# | RST_ IN# | GND | - | - | GND | IPMB_ SDA | IPMB_ SCL | GND | 2 |
| GND | +12V | +12V | GND | +12V | +12V | GND | +12V | +12V | GND | - | - | 1 |
| L | K | J | I | H | G | F | E | D | C | B | A | |

# 3 Appendix

## 3.1 Literature and Web Resources

- G213 data sheet with up-to-date information and documentation:
  www.men.de/products/02G213-.html

### 3.1.1 XMC

- XMC PCI Express Protocol Layer Standard
  VITA 42.3-2006; June 2006
  VMEbus International Trade Association
  www.vita.com
- Standard for VITA 42.0 XMC
  VITA 42.0-2008; December 2008
  VMEbus International Trade Association
  www.vita.com

### 3.1.2 PMC

- PMC specification:
  Standard Physical and Environmental Layers for PCI Mezzanine Cards: PMC, 1386.1; 1995; IEEE
  www.ieee.org
- PCI-X Auxiliary Standard for PMCs and Processor PMCs
  ANSI/VITA 39-2003
  VMEbus International Trade Association
  www.vita.com

### 3.1.3 PCI Express

- PCI Express Base Specification, Revision 2.0
  December 20, 2006
  PCI Special Interest Group
  www.pcisig.com

## 3.2 Finding out the Product's Article Number, Revision and Serial Number

MEN user documentation may describe several different models and/or design revisions of the G213. You can find information on the article number, the design revision and the serial number on two labels attached to the board.

- **Article number:** Gives the product's family and model. This is also MEN's ordering number. To be complete it must have 9 characters.
- **Revision number:** Gives the design revision of the product.
- **Serial number:** Unique identification assigned during production.

If you need support, you should communicate these numbers to MEN.

***Figure 5.*** *Labels giving the product's article number, revision and serial number*